

If, on July 30, Gerry purchases an old, used delivery truck, the accountant will show this revised situation as follows:

| GERRY MANERO'S FURNITURE MART Balance of Assets and Equities July 30, 19X5 | | | |
|--|--------------|----------------|----------|
| Assets | | Equities | |
| Cash | \$10,000 | Owner's equity | \$15,000 |
| Delivery truck | <u>5,000</u> | | |
| Total assets | \$15,000 | | |

Similarly, a decision executed a week later to obtain a \$5,000 loan will prompt the accountant to reflect another change in Gerry's financial situation:

| GERRY MANERO'S FURNITURE MART Balance of Assets and Equities August 6, 19X5 | | | |
|---|--------------|----------------|---------------|
| Assets | | Equities | |
| Cash | \$15,000 | Liabilities | |
| Truck | <u>5,000</u> | Bank loan | \$ 5,000 |
| Total assets | \$20,000 | Owner's equity | <u>15,000</u> |
| | | Total equities | \$20,000 |

We'll return to Gerry's entrepreneurial endeavor, but for the moment let's examine what the accountant has done to this point. By applying the same concepts we used in our home purchase illustration, he has prepared a financial evaluation of Gerry's new business on July 27, July 30, and August 6. This evaluation, like the loan application in our first illustration, represents the balance of the assets and equities of the business as it stood on these dates.

In accounting, such a statement is called a **balance sheet**. It is one of two basic accounting documents used to report on the

financial condition of a company. Its name is well chosen, since it (1) always shows a balance of assets and equities and (2) must always balance assets and equities, as we've already seen from the dual aspect concept.

Under normal business circumstances, the balance of assets and equities being reported in a balance sheet is constantly changing. For example, each of the three balance sheets shown for the furniture mart is different from the others as a result of the business Gerry Manero transacts on each of those days. To put it another way, the asset cash in almost any company can change several times during one day or even within one hour.

Thus a balance sheet can reflect the status of assets and equities only at a given moment. For this reason, the balance sheet is always dated, and that date is critical to a clear understanding of the financial information being presented.

Most companies prepare a formal balance sheet at least once annually, usually as of the end of the year. Clearly, the elementary nature of Gerry Manero's financial affairs simplifies the preparation of a balance sheet in his business; however, the same basic concepts are used regardless of the size or complexity of the business.

For example, Exhibit 1-1 shows the balance sheet of another GM—not Gerry Manero but General Motors, one of the world's largest industrial organizations.

As you look at the GM balance sheet, note the prominence of its date, which indicates the exact day of the status report on the company's assets and equities. Next, note that the left side of the statement lists the assets owned by the corporation. (Some or all of the various technical classifications of assets, liabilities, and equities shown on the GM balance sheet may be unfamiliar to you. At this point, we can ignore that fact, for we are looking at balance sheets in very broad conceptual terms and will present a more detailed discussion of their makeup in Chapter 3.)

The right side of the statement lists the claims on the company's assets. As in the two simpler cases already presented, these are the claims of the creditors, or the liabilities. (There are also a series of claims called **reserves**, which in this instance, as in many others, represent claims on assets that can be made by employees as a result of benefit payments that the company is legally commit-

2. When a business provides a good or service, the monies it receives increase owner's equity and are called revenues.
3. The costs that business incurs to provide the good or service decrease the owner's equity and are called expenses.
4. Under the accrual concept, net income is measured by the difference between revenues and expenses, *not* by increases or decreases in cash.

An income statement summarizes the revenues and expenses of a business over a given period of time and reflects the difference between the two as net income if revenues are greater than expenses. If expenses are greater than revenues, there has not been a net income to the owners, and the result is shown as a **net loss**.

A term that is often used interchangeably with net income is profit. Thus, an income statement is also referred to as a statement of profit and/or loss (often abbreviated P/L statement). The choice is only one of terminology, since the purpose and the concept of the statement are the same under either label.

An income statement for Gerry Manero's Furniture Mart for the period between July 27 and September 15 would appear as follows:

| GERRY MANERO'S FURNITURE MART Income Statement Period Ending September 15, 19X5 | |
|---|---------------|
| Revenues | \$2,400 |
| Less cost of goods sold | <u>1,800</u> |
| Net income | <u>\$ 600</u> |

The source of these figures is as follows:

Revenues are increases to owner's equity through sales of merchandise:

| | |
|--|----------------|
| September 8 | \$ 600 |
| September 12 | 800 |
| September 15 | <u>1,000</u> |
| Total revenues as per income statement | <u>\$2,400</u> |

Expenses represent decreases to owner's equity for the costs associated with providing these goods:

| | |
|--|----------------|
| September 8 | \$ 500 |
| September 12 | 600 |
| September 15 | <u>700</u> |
| Total expenses as per income statement | <u>\$1,800</u> |

Revenues minus expenses equal net income, or \$600, which is the net income to owner's equity for the period July 27 through September 15.

Our income statement shows the same net increase to owner's equity as the comparison of the balance sheets of the furniture mart for July 27 and September 15. This is as expected, since net income represents the increase in owner's equity that takes place through the conduct of a company's business.

In theory, the total net income of a business over its entire life is simply the amount the owners get out of it compared to what they originally put in. It is possible to measure the net income of business this way. The owner's equity could be calculated after 10 years of business activity and compared with the owner's original equity. If there has been an increase, as there should have been, this would be the net income of the business for the total 10-year period. Although an accountant could measure the net income of a business this way, it is not practical for two reasons:

1. Neither management nor the owners of a business can wait until the 10-year period is over to see how the business has fared.

business is an important as well as a nettlesome question. There are three possibilities.

1. *Value the assets at their market value.* Simple enough—just state the worth of the property today. But this isn't always as easy as it sounds. The value of something can be highly dependent upon the prospective purchaser's particular needs; for this reason, it's possible to get three, four, or five differing evaluations of the worth of any particular property. The economists call this the theory of **utility**. However, an accountant who uses this concept will again run directly into the problem of subjectivity.

2. *Value the assets on the basis of the amount of money that would be required to replace them.* This replacement value does away with a value range that depends on the prospective buyer's needs. The cost of replacing something, however, often depends on how it is replaced. For example, it's standard practice in most businesses to obtain at least three or four bids before major construction is undertaken. The reason, of course, is that the cost can vary depending on who does the work, what material they use, how efficiently they go about the construction, and other factors. The use of a replacement approach almost always provides a range rather than a single common value to place on the asset.

3. *Determine the value of any particular asset on the basis of its original cost.* The advantage of this particular approach, of course, is that it's easy to determine and subsequently document exactly what you paid for something. For example, how would you get a variety of opinions about the value of your attaché case? Some opinions may be based on its so-called market value, some possibly on its replacement value. The one cost that you and others could agree on, however, would be the cost you originally incurred to buy it. To establish this cost, you need only to produce the original invoice. This does not necessarily suggest that everyone would agree that you had made a good buy. The fact remains that you can, on the basis of the original cost, objectively establish the value of the case. This is the so-called **cost concept**.

The objective approach is extremely important to the account-

tant, and its practical advantages are obvious. The cost concept gives the accountant a simple, workable method by which to record asset values on a balance sheet. Executives and businesspeople who understand this concept always know immediately the basis for the asset values that appear in any balance sheet, since under the cost concept they are always recorded at original cost.

The primary appeal of the cost concept is its expediency and objectivity. As we noted earlier, however, the going concern concept is also relevant to the question of determining asset values. Under that principle, the accountant assumes that there will be little likelihood of the need to determine asset values in liquidation. Because it is assumed that the assets will be used in the normal conduct of the business rather than sold or disposed of, the question of the value of the assets does not become as critical as it might otherwise. In this way the going concern principle facilitates the accounting problem of determining the values of assets.

The Realization Principle

A routine business transaction often involves more steps than meet the eye. Let's take, for example, a fictitious company—EZI Manufacturing Company—and its sale of widgets. In December, the widgets were manufactured at the factory. In January, the widgets were shipped to the customer, who paid EZI part of the bill for the widgets in February and the rest in March. In total, this rather simple business transaction has spanned a period of four months.

The question for the accountant is: When did the business actually obtain its sales revenue? The more formal statement of the problem is: When was the business's revenue "realized"? To answer this question, the accountant uses the realization principle.

This principle, like so many of the others, is simple. It says that revenue is realized at the time goods or services are furnished.

Assets

Over a period of time, a standard balance sheet format for the presentation of a business's basic financial data has evolved, in which assets are subdivided into three major categories: **current assets**, **fixed assets**, and **other assets**.

Current Assets

The five items described below are the most common forms of current assets, although there could be others. Assets are classified as current as long as they are cash, or can be converted into cash, within the customary operating period of the business (usually one year). Current assets, therefore, are cash or assets that can become the equivalent of cash within one year's time.

1. *Cash*. Cash usually represents the funds on hand held by the business, that is, bills or coin and funds that are readily available in checking accounts. It does not include cash funds for which there is some legal constraint against use, such as funds held in special deposits or in escrow.

2. *Marketable securities*. Marketable securities represent temporary investments in the stocks or bonds of other businesses or enterprises and possibly in government bonds. Next to cash, they are usually the most liquid assets and can be turned into cash on short notice.

3. *Accounts receivable*. Accounts receivable represent monies owed to the business by customers for the purchase of merchandise. Accounts receivable are created when goods or services are provided and the business receives a legally enforceable promise of payment rather than cash. In our personal lives, we create accounts receivable whenever we buy merchandise on credit and then wait to make payment on it until we receive a statement of account for the purchase. Accounts receivable are often shown as a gross amount of accounts receivable, and then an "allowance for doubtful accounts" is shown as a deduction. This allowance represents an estimate of accounts receivable on which the business does not expect to be able to collect. (We discuss the account-

ing of doubtful accounts receivable in more detail in subsequent chapters.)

4. *Inventories*. Inventories represent merchandise that has been purchased by a business and is being held in stock until such time as it is resold. Gerry Manero's Furniture Mart is an example of this type of inventory. When a business manufactures its own product for sale, inventories include the value of the merchandise or product that has been manufactured and is being held in readiness for sale. Moreover, such a business often needs raw materials from which to make the product. Also, at any given time certain products are in the process of being manufactured. Both of these inventories are made in addition to the finished products inventory. Many manufacturing companies often show their inventories in this order: raw material inventories, goods in process inventories, and finished goods inventories.

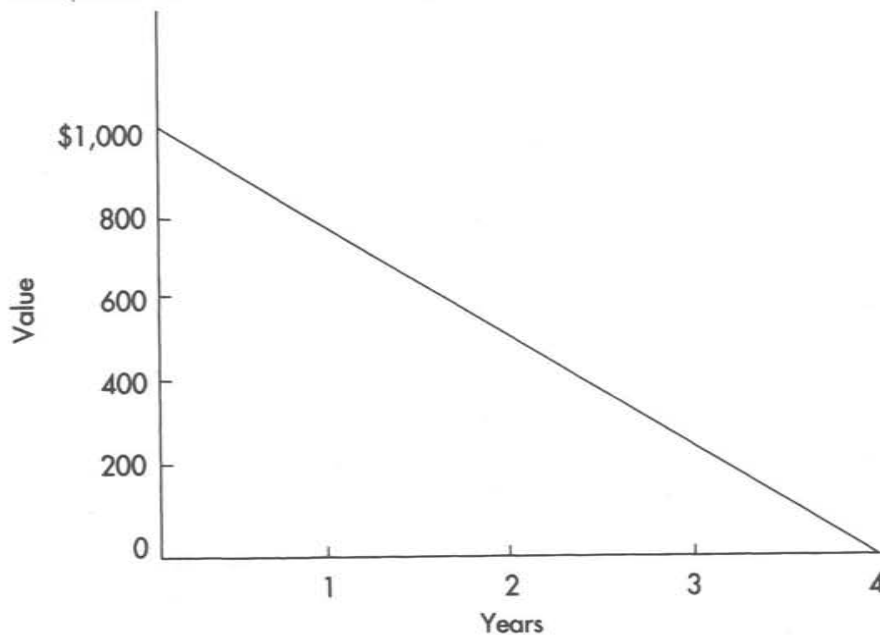
5. *Prepaid expenses*. Prepaid expenses are those that have been paid in advance by the business. They constitute a right to a future service that will be used but that has not yet been used by the business. A common example of a prepaid expense is the insurance coverage a business pays for in advance of receiving services.

Fixed Assets

Fixed assets consist of tangible permanent investments in so-called capital facilities, usually brick and mortar, or equipment. In many balance sheets, these particular assets are much more descriptively and accurately labeled **property, plant, and equipment**.

Almost all these fixed assets are shown in the following order in the balance sheet: gross fixed assets, accumulated depreciation, and net fixed assets.

The term **gross fixed assets** refers to the original value, that is, the cost incurred to purchase or construct the physical facility (note the application of the cost concept). Gross fixed assets are reduced by an item called **accumulated depreciation**. Depreciation is a major accounting concept in itself, which we shall discuss in detail in subsequent chapters. At this point, let us define depreciation as an estimate of how much the original value of all the com-

Exhibit 6-1. Straight-line depreciation.

of cost less the estimated salvage value of \$200, by the useful life period of four years, as shown below:

| | |
|--|----------------|
| Purchase price of asset | \$1,000 |
| Delivery cost | 100 |
| Installation cost | 100 |
| Total cost of asset | \$1,200 |
| Less estimated salvage value | 200 |
| Asset cost to be depreciated | \$1,000 |
| $\frac{\$1,000 \text{ (asset cost to be depreciated)}}{4 \text{ years}} =$ | \$250 per year |

If we were to plot this process graphically, it would appear as shown in Exhibit 6-1.

Because the process of depreciating the estimated net cost of

the fixed asset in equal annual amounts of depreciation expense results in a straight line, this technique for determining depreciation expense is called the **straight-line method of depreciation**. It is simple in both conception and application and is the most commonly used approach in U.S. business. Applying this method, the resulting usage cost or depreciation expense becomes the same for each year of the estimated useful life of the asset. For example, an asset with a net asset value of \$1,000 with an estimated useful life of ten years would have a yearly amount of \$100 expensed as depreciation each year.

In real life, however, assets do not always necessarily wear out or obsolesce at the same rate each year. The straight-line method of depreciation ignores this fact. As an everyday example of this phenomenon, consider your own automobile, on which the obsolescence factor is much more pronounced in the earlier years of ownership and operation. The same holds true in many business situations.

For this reason, three different so-called accelerated methods of depreciation have been developed and are now accepted accounting practice. Unlike the straight-line method, which takes equal annual amounts for usage, accelerated methods take more of the expense for the usage of the asset at the beginning of its life than at the end. There are three accelerated methods of depreciation, which are described below.

Sum of the Years Digits

The formula for calculating sum-of-the-years-digits depreciation is a fraction, with the numerator representing the years of remaining useful life of the asset and the denominator indicating the sum of the digits of the years of estimated useful life. Using this approach, we would depreciate the machine with a net asset value of \$1,000 in the following way:

1. Calculate the sum of the digits of the years of estimated useful life; that is, 4 years = 1 + 2 + 3 + 4 = 10.
2. Determine depreciation to be taken in each year, starting in the first year, for the number of years of remaining useful life.

The costs of services and materials in the United States have clearly been increasing. When this happens, the use of LIFO inventory evaluation methods tends to lower net income. Since lower net income results in lower tax payments to the United States government, it has been very much in the interest of business to use the LIFO method of inventory evaluation, and it is a commonly used method in U.S. business today. The important fact for the nonfinancial executive to appreciate, however, is that the accountant does have options and that the method he chooses can have a significant influence on the so-called final net book results of the business.

Accounts Receivable

We turn now to the final special accounting problem, which is accounts receivable. Almost all businesses must sell on credit. When they do, they receive an account receivable (a legal obligation to be paid) in lieu of cash. Accounts receivable appear on the balance sheet as assets. If for some reason the account receivable cannot be collected, it has no value. Fortunately, most accounts receivable are collected, and, in fact, sound credit practices should prevent a business from selling on credit to anyone from whom it doesn't think it can collect. Despite these precautions, every business ends up with some uncollectable accounts. Various accounting methods are used to deal with this particular aspect of business life.

The most direct approach is simply to write off a bad debt once it becomes clear that payment will not be received. When this is done, the accountant reduces the value of accounts receivable by the amount of the write-off and increases the expense, and the uncollected payment is called a **bad debt**. The problem with this approach is that the accountant has to wait for an actual bad debt loss to transpire before it can be recognized. In the interim, however, the asset of accounts receivable is not shown in either the most realistic or the most conservative manner, since it is a known fact that all the accounts receivable won't be collected. What is not known is who won't pay and the amounts. To overcome this problem, the general practice is to make a comprehensive estimate

of the total amount of accounts receivable that won't be collected. This estimate is called an **allowance for doubtful accounts**. This allowance is taken as a reduction from the accounts receivable on the balance sheet and usually appears as shown:

| | |
|--------------------------------------|------------------|
| Accounts receivable | \$200,000 |
| Less allowance for doubtful accounts | <u>7,000</u> |
| | <u>\$193,000</u> |

At the same time the allowance for doubtful accounts is created and used to decrease the value of the asset, a corresponding increase occurs in the expense—bad debts.

The actual amount that is to be set up as allowance for doubtful accounts is usually based on the company's past experience. Management may determine that a certain percentage of the annual net sales, say 2 to 3 percent, is appropriate. Alternately, it may make a similar determination on the basis of only its credit sales. When this is done, the allowance is reflected in the balance sheet, as was shown.

On the occasion of an actual bad debt write-off, both the asset of accounts receivable and the allowance are reduced by the amount of the write-off. If we assume a write-off of \$1,000, the figures just shown would be modified as follows:

| | <i>Before Write-off</i> | <i>After Write-off</i> |
|--------------------------------------|-----------------------------|----------------------------|
| Accounts receivable | \$200,000 | \$199,000 |
| Less allowance for doubtful accounts | <u>7,000</u> | <u>6,000</u> |
| | <u>\$193,000</u> | <u>\$193,000</u> |

Accounting for fixed assets, inventory, cost of goods sold, and bad debts involves the nonfinancial executive in some special problems and aspects of the accounting process. This chapter has attempted to demonstrate that the methods and techniques used by accountants are less difficult and enigmatic than they may seem and that it is important for the nonfinancial executive to understand them.

| | |
|----------------------------------|---------|
| Dr. Net income | \$2,000 |
| Cr. Cost of goods sold | \$2,000 |

The next expense account is salaries and wages, which has a debit balance of \$600. To be closed, it must also have a credit entry of \$600, thus:

| | |
|----------------------------------|-------|
| Dr. Net income | \$600 |
| Cr. Salaries and wages | \$600 |

The depreciation and insurance accounts show a balance of \$50 each. They receive exactly the same treatment as the other two expense accounts, and we have:

| | |
|------------------------------------|------|
| Dr. Net income | \$50 |
| Cr. Depreciation expense | \$50 |

| | |
|---------------------------------|------|
| Dr. Net income | \$50 |
| Cr. Insurance expense | \$50 |

Closing the Net Income Account

All the accounts in the income statement have been closed except for the final one, net income. It, too, must be closed. By adding the debits and credits, we arrive at a debit balance of \$2,700 and a credit balance of \$3,000.

To close the account, we must make a debit entry of \$300. The other half of the entry is to be a credit to owner's equity. In formal form:

| | |
|---|-------|
| Dr. Net income | \$300 |
| Cr. Owner's equity (retained earnings, Exhibit 7-1) | \$300 |

Throughout the closing process, and particularly in this last step, we can see the consistent relationship between the mechanics of the accounting process and the basic accounting concepts. The credit to owner's equity in the closing of the net income account is, of course, an increase—which is exactly how we described the function of the income statement in conceptual terms.

GERRY MANERO'S FURNITURE MART Balance Sheet January 31, 19X6

| Assets | | Equities | |
|---------------------|--------------|-------------------|--------------|
| Cash | \$4,700 | Accounts payable | 0 |
| Accounts receivable | 100 | Notes payable | 0 |
| Inventories | <u>2,600</u> | Owner's equity | |
| Current assets | \$ 7,400 | Capital stock | \$10,000 |
| Fixed assets | \$4,950 | Retained earnings | <u>2,900</u> |
| Prepaid assets | <u>550</u> | Total equities | \$12,900 |
| Total assets | \$12,900 | | |

GERRY MANERO'S FURNITURE MART Income Statement For Period Ending January 31, 19X6

| | |
|-------------------------|---------------|
| Sales revenue | \$3,000 |
| Less cost of goods sold | <u>2,000</u> |
| Gross margin | \$1,000 |
| Less | |
| Salaries and wages | 600 |
| Depreciation expense | 50 |
| Insurance expense | <u>50</u> |
| Total expenses | 700 |
| Net income | <u>\$ 300</u> |

Preparation of Financial Statements

The final step in the accounting process is the preparation of financial statements. To do this, we simply take the balances that appear in the ledger of accounts for the balance sheet and income statement and cast them into the conventional format for both these statements. Examples are shown for Gerry Manero's Furniture Mart.

Exhibit 8-2. Calculation of inventory unit costs and general and administrative expenses.

| | COST OF GOODS SOLD | | | |
|-----------------|--------------------|------------------|------------------|------------------|
| | Case A | | Case B | |
| | Total | Per Unit | Total | Per Unit |
| Labor | \$250,000 | \$ 50,000 | \$250,000 | \$ 50,000 |
| Materials | 200,000 | 40,000 | 200,000 | 40,000 |
| Overhead | | | | |
| 80% × \$500,000 | 400,000 | 80,000 | | |
| 50% × \$500,000 | | | 250,000 | 50,000 |
| Totals | \$850,000 | \$170,000 | \$700,000 | \$140,000 |

| | GENERAL AND ADMINISTRATIVE EXPENSES | |
|--|-------------------------------------|-----------|
| | Case A | Case B |
| Overhead | | |
| Factory | \$500,000 | \$500,000 |
| General and administrative | | |
| Designated as factory overhead | \$400,000 | \$250,000 |
| Balance, designated as general and administrative expense for the period | \$100,000 | \$250,000 |

administrative expenses is unclear. In Case A (see Exhibit 8-2) the accountant assumes that 80 percent of overhead costs are product costs. In Case B she assumes that only 50 percent of the overhead costs are product costs. With these assumptions, the calculation of product costs for the cost of goods sold and inventories for the period is as shown in Exhibit 8-2.

The net income for the period, on the basis of the sales of three units of machine tools at a price of \$250,000 per unit, would appear as in Exhibit 8-3.

Exhibit 8-3. Calculation of net income.

| | Case A | | Case B | |
|---|-----------|-----------|-----------|-----------|
| | Per Unit | Total | Per Unit | Total |
| Sales revenue (3 units) | \$250,000 | \$750,000 | \$250,000 | \$750,000 |
| Less cost of goods sold (3 units) | 170,000 | 510,000 | 140,000 | 420,000 |
| Gross margin | \$ 80,000 | \$240,000 | \$110,000 | \$330,000 |
| Selling expense | | 100,000 | | 100,000 |
| General and administrative expenses | | 100,000 | | 250,000 |
| Net income/loss before taxes | | 40,000 | | (20,000) |
| Value of inventory shown on balance sheet at end of accounting period (2 units) | | \$340,000 | | \$280,000 |

We will leave unanswered the question as to whether the company made or lost money. In practice and with a great deal more information, accountants could undoubtedly arrive at a consensus. In fact, they do, since some choice must be made between period and product costs to determine the net income of a manufacturer. The convention of consistency, which requires that the same approach be used from one accounting period to another, can be of assistance in making manufacturing cost calculations more meaningful over an extended period. Still, the choice is less than scientific and can be significant. No one can make intelligent use of the accounting and financial data of a manufacturing organization without recognizing this fact.

Manufacturing Cost Systems

Basic as they may be, the concepts and issues we have discussed provide sufficient background for a brief and general discussion of different types of manufacturing cost systems: absorption cost

Exhibit 8-5. Income statement of XYZ Tool Machinery, Inc., under a standard costing system.

| | |
|-------------------------------------|-------------|
| Sales | \$2,500,000 |
| Less | |
| Cost of goods sold at standard rate | \$1,400,000 |
| Variances | 200,000 |
| Cost of goods sold | \$1,600,000 |
| Gross profit | \$ 900,000 |
| Less | |
| Selling expenses | 200,000 |
| General and administrative expenses | 500,000 |
| Total Expenses | \$ 700,000 |
| Net income before taxes | \$ 200,000 |
| Variances | |
| Material variance (higher cost) | \$ 100,000 |
| Labor variance (higher cost) | 100,000 |

of units manufactured during a given period and then to apply the standard cost rate to this volume of production. The result is the total shown as the standard cost of manufacture. Sometimes standard costs are built up on the basis of past experience and cost data, rather than predetermined through engineering studies.

Under a standard costing system, the procedures involved in the recording of actual costs are not discontinued. Actual costs incurred are also accounted for. They can then be compared against the standard costs, and the difference can be shown as a variance. A variance can be either favorable or unfavorable. If actual costs are less than those established in the standard costing system, the variance is favorable; if actual costs are higher, the variance is unfavorable. Exhibit 8-5 shows how the net income for XYZ Tool Machinery, Inc., might be recorded under a standard costing system.

The appeal of the standard costing system is obvious. It facilitates management's evaluation as to whether the manufacturing process is being carried on efficiently. By providing a continuing

gauge of efficiency, it allows management to take action when necessary to correct a problem or inefficiency more quickly. Also, use of the system can often actually facilitate and simplify the accounting process. This is particularly true in the manufacture of high-volume items, where it becomes extremely difficult to record on an actual basis the cost of manufacture for each unit. It is important to recognize, however, that the final net income must always be based on the actual costs incurred and not on the standard cost. A standard costing system can involve standards only for direct costs and/or direct plus full costs. In other words, a standard costing system can be a direct standard costing system or a standard absorption costing system.

Process Cost Systems

The system of costing in which products are manufactured in a series of continuous processes and costs are accumulated by department or cost center is known as **process costing**. Process costing determines how manufacturing costs that are incurred during each period are to be allocated; the ultimate goal is to compute the total units costs for determining income. To accomplish this objective, individual work-in-process accounts are maintained for each production department or manufacturing process.

These work-in-process accounts accumulate direct material costs, direct labor costs, and factory overhead costs as the different processes are performed within each department. As units are completed in one department, they are transferred with their respective costs to another department. The next department receives the completed unit(s) from the previous department and considers the unit(s) a unit of raw material until all the processes are completed, at which time the units are considered a finished good.

A unit cost of production is calculated for each process, and the total cost of production represents the sum of the unit costs for each process through which a product must flow. To determine the unit cost of the process, the following simple calculation is made:

$$\frac{\text{Total cost in process}}{\text{Units produced in process}} = \text{unit cost of process}$$

Exhibit 9-6. Contribution analysis by sales region.

| EZ CORPORATION | | | | |
|--|------------------|------------------|------------------|-------------------|
| | Region A | Region B | Region C | Total |
| Sales | \$500,000 | \$300,000 | \$200,000 | \$1,000,000 |
| Less | | | | |
| Variable costs | | | | |
| Production | 250,000 | 160,000 | 75,000 | 485,000 |
| Marketing | | | | |
| Transportation | 25,000 | 30,000 | 15,000 | 70,000 |
| Commissions | 40,000 | 25,000 | 10,000 | 75,000 |
| Total variable costs | 315,000 | 215,000 | 100,000 | 630,000 |
| Contribution after variable costs | 185,000 | 85,000 | 100,000 | 370,000 |
| Less | | | | |
| Direct fixed costs ¹ | | | | |
| Selling | 45,000 | 5,000 | 15,000 | 65,000 |
| Administrative | 25,000 | 15,000 | 5,000 | 45,000 |
| Total direct fixed costs | 70,000 | 20,000 | 20,000 | 110,000 |
| Region contribution | \$115,000 | \$ 65,000 | \$ 80,000 | \$ 260,000 |
| Less | | | | |
| Indirect fixed expenses | | | | |
| Manufacturing | | | | 165,000 |
| Selling | | | | 45,000 |
| Administrative | | | | 15,000 |
| Total indirect fixed expenses | | | | 225,000 |
| Operating profit | | | | \$ 35,000 |

¹ Direct fixed costs by region were obtained by deducting allocations of fixed selling and administrative expenses in Note 2, Table 9.5.

contribution analysis, costs relevant to the decision at hand are analyzed to determine whether—and by how much—that cost will vary as a result of the decision.

With Gerry's special widget order, contribution analysis facilitated an assessment of the economic consequences of the decision he had to make. This was also true for the EZ Corporation's analysis of profitability by sales region.

Exhibit 9-7. Analysis of contribution by product.

| EZ CORPORATION | | | | |
|--|------------------|------------------|-----------------|------------------|
| | Product X | Product Y | Product Z | Total |
| Sales | \$230,000 | \$125,000 | \$42,000 | \$397,000 |
| Less | | | | |
| Variable costs | | | | |
| Production | 125,000 | 70,000 | 20,000 | 215,000 |
| Marketing— | | | | |
| commissions | 15,000 | 6,000 | 2,000 | 23,000 |
| Marketing— | | | | |
| transportation | 7,000 | 2,400 | 500 | 9,900 |
| Total variable costs | 147,000 | 78,400 | 22,500 | 247,900 |
| Contribution after variable costs | 83,000 | 46,600 | 19,500 | 149,100 |
| Less | | | | |
| Direct fixed costs | | | | |
| Production | 0 | 0 | 0 | 0 |
| Marketing | 10,000 | 8,000 | 3,000 | 21,000 |
| Total direct fixed costs | 10,000 | 8,000 | 3,000 | 21,000 |
| Product contribution | \$ 73,000 | \$ 38,600 | \$16,500 | \$128,100 |
| Less | | | | |
| Indirect fixed expenses | | | | |
| Manufacturing | | | | 40,000 |
| Selling | | | | 20,000 |
| Administrative | | | | 10,000 |
| Total indirect fixed expenses | | | | 70,000 |
| Operating profit | | | | \$ 58,100 |

For the manager, contribution analysis holds an additional attraction. From our exhibits, we can see that under the contribution concept a manager is never charged with an expense that his decision did not influence.

Compare, for example, the performance reading on sales region C in Exhibit 9-5 with that of the same region in Exhibit 9-6. In Exhibit 9-5, the performance of region C's manager was assessed after he had been charged with \$20,000 of indirect selling

Keep in mind that the question of whether an investment is justified by the earnings or savings it will create over its life cannot be answered for all investments. Some investments do not have tangible incentives—such as savings or earnings—that can justify them. The construction of an employees' lunchroom or a waste-treatment facility may be one of the most important investments a business makes for its future, but the benefits of either of these investments cannot always be quantified. For investments of this kind, we have to rephrase our question: Is the investment justified by the *anticipated* benefits it will create over its life?

More frequently, however, the benefits associated with a particular investment are tangible and can be measured reasonably accurately. For these investments, as we pointed out earlier, the first consideration is whether the investment can be economically justified.

Let's look first at the almost self-evident basic steps involved in any financial, economic analysis of a new investment.

1. Identify and quantify the amount of the investment.
2. Determine the net savings and/or the earnings that will result from the investment.
3. Identify the effects of tax costs on the new savings or earnings that you expect from the investment. In some cases, tax consequences can also affect the amount of the investments, as in the case of investment credits and/or other such incentives.
4. Determine whether the investment is justified by the savings or earnings or by some of the intangible benefits it will create.

In principle, the basic steps in the investment process appear simple; in actual application, however, they can often become more complex. For example, we've said that the first step in any analysis of an investment is to identify the amount of the investment itself. What could be more simple? All we need to know is the cost of the machinery or equipment (and the costs involved in delivery and installation) in which we want to invest.

In practice, the problem of accurately assessing the real magnitude of any new investment is not always completely straight-

forward. For instance, is the investment in a new petroleum refinery only the cost of the refinery itself? What about the service stations that may need to be built to sell the gasoline? Or the trucks, the pipelines, and the tankers to transport the crude oil? This example illustrates an important point: you can't determine whether savings or earnings will justify an investment until you're sure how much that investment will be.

The second step in investment analysis calls for a determination of the net savings, earnings, or benefits. Here again, the seeming simplicity of the step belies the possible hazards involved. Why? Because, of necessity, estimates of savings or earnings must be based on assumptions about the behavior of costs or revenues in the future. And, as the old saying goes, "Forecasting is difficult when it pertains to the future."

Earnings estimates based on assumed sales growth and/or cost savings that are used to justify an investment initially often fail to hit the mark in the face of inevitable uncertainties of the rapid technological and competitive changes that are so pronounced in today's business environment.

As the foregoing examples suggest, we need to appreciate two fundamental aspects of ROI analysis.

The first and most important is that ROI analysis—no matter how extensive, complex, or sophisticated—is no better than the basic assumptions used in determining the amount of the investment and the anticipated earnings or savings. The second, closely related to the first, is that any accurate ROI assessment can include only those costs that are truly, objectively relevant to the investment decision being evaluated. As obvious as these simple points may seem, "relevant economics" and "realistic assumptions" are the sine qua non of any intelligent, objective analysis of a new investment.

The capital investment decision, as we have noted, usually requires an estimate of earnings in the future, and the investment to generate those benefits normally involves significant expenditure for property, plant, and/or some equipment or so-called fixed assets. These fixed assets are a monument to the future.

Should the investment prove to be unprofitable, these assets, the monument, is not easily disposed of. Furthermore, associated

terminal or residual value at the end of their useful lives is recognized in computing depreciation costs and also in all present value methods of ROI analysis. This is called the **residual value assumption**, which is nothing more than an assumption about what cash payment can be expected for an asset at the end of that asset's useful life. As a general approach, the residual value of an asset is generally assumed to be the same as its expected final salvage value (although we should note that in today's economy, the tendency for tangible property to appreciate or hold its value has perhaps made this rather simplistic and conventional approach somewhat anachronistic). Under this method, the residual value assumption for the widget-forming machine is the \$1,800 that we have estimated as its salvage value. As we will see in subsequent illustrations, this residual value is assumed to be a cash inflow at the end of the investment's or project's economic life.

With these general points in mind, we can now examine the first of three basic methods of present value ROI analysis—the present value method.

The Present Value Method

Under the **present value** method, an investment proposal is acceptable if, apart from nonmonetary considerations, the present value of cash earnings at the desired rate of return is greater than or equal to the investment that is being made to generate the savings or earnings. The procedures for developing the computation to determine whether an investment is acceptable under the present value method can be summarized as follows:

1. Estimate the future cash outflows and inflows associated with the capital investment proposal for each specific year of the project's or investment's expected life.
2. Determine the rate of return desired for the project. (In Chapter 13, we explore the various approaches to selecting such a rate; for illustrative purposes, we will choose arbitrary rates in the following examples.)
3. Refer to the present value tables (Appendix B) to choose the correct present value factors under the rate of return that has

been selected. Note that different present value factors will be required for each year.

4. Calculate the present value of the cash inflows (savings) for each year by multiplying them by the present value factors for that year.

5. Add the total amount of the present value of each year's inflow for the life of the project. If the amount equals or exceeds the amount of the investment, that investment will be acceptable. If the sum of the net present value of the cash flows for each year is less than the amount of the investment, the investment will be unacceptable.

6. Bear in mind that nonmonetary considerations have been ignored. Make certain it is safe to do this. Also recognize that the validity of all these sophisticated calculations is no more accurate than the assumptions that underlie the estimates of investment or savings.

Now let us turn to an actual application of these procedures, again using our illustration of the investment in the widget-forming machine. The elements of our ROI analysis for this project under the present value method are set forth in Exhibit 11-6.

According to the procedures that we outlined above, the investment analysis under the present value method at our arbitrarily designated 20% rate of return appears in Exhibit 11-7.

The total present value of all the cash savings (inflows) that are assumed for nine years, including the assumed cash residual value, amounts to \$27,560, which is \$10,460 greater than the amount of our cash investment of \$17,100. Therefore, under our present value decision rule, we can conclude that the investment is justified, since the present value of the savings (the cash inflows) exceeds the cash outflows associated with the investment at the desired rate of return of 20%.

For contrast, we will now follow exactly the same procedures, but in this instance we will set our desired rate of return at 30%. At this earnings rate, our present value analysis results in the figures shown in Exhibit 11-8.

As the calculations indicate, the expected cash savings or cash inflows, discounted at a present value factor of 30%, give a total present value of \$20,541, which is \$3,441 more than the \$17,100

as a result of the methodology, the payback method gives weight only to those cash flows that occur at the beginning of the project. As we shall see later, this is also a limitation, but it is certainly in line with the general concept of the time value of money.

In the same way, of course, present value methods show much more precisely the greater value of cash earnings received in the early years of a project. In a sense, the payback method takes into account the time value of money very crudely; however, it does not fully measure the time-money rate of return as present value methods do. Furthermore, it totally ignores the profits and cash inflows that occur after the investment has been repaid. The residual values or cash flows are also overlooked. This particular shortcoming can be critical in a long-term investment. Thus, the payback method is an inadequate tool for evaluating the many investments that are long term and that are important to a company's future growth.

As a final point, we should note that, however useful it is to evaluate an investment in terms of the time period in which it will be paid back, this measurement ignores any expression of projectability or of absolute dollars. It is difficult, therefore, to compare or rank meaningfully alternative capital investments with the payback method.

In summary, the advantages and limitations of the payback methods are these:

Advantages

1. It is easy to calculate and understand
2. It provides good rough indicator for preliminary investment screening
3. It measures cash recoverability
4. It helps evaluate the risk associated with investments in terms of time until payback. Time expression can help evaluate investment in terms of risk
5. It appropriately emphasizes earlier cash flows

Limitations

1. It does not truly take into account the time value of money

2. It does not consider benefit of earnings after investment has been repaid
3. It has limited use as a tool to compare and rank alternative investments

The Accounting Method

The accounting method of ROI analysis is also sometimes referred to as the **book rate of return method**. Either designation suggests the key feature of the method—that it measures ROI in terms of standard accounting procedure and technique. This particular feature is not without benefit, since the ultimate *raison d'être* for any investment, even for an employee washroom, is increased profitability. The accounting method of investment analysis helps keep this point in focus. It also facilitates capital investments post-mortems in order to determine whether the actual profitability of new investments is in line with the original estimates.

Although the accounting method makes use of standard accounting methods that might be somewhat confusing to a neophyte, it is also easy to calculate and understand. The method, however, suffers from the same limitation as the payback method in that it does not in any way recognize the time value of money; indeed, it gives no weight to either the amounts or the timing of cash flows. Finally, the methodology implicitly assumes that the investment and the associated savings or earnings will last for the depreciable life of the investment involved. In today's dynamic and volatile business environment, this can be a highly tenuous assumption. A machine that molds plastic *Star Wars* toys may last for 15 years; whether the faddish demand for such products will last that long is another question. The advantages and limitations of the accounting method are these:

Advantages

1. It emphasizes accounting profit and loss effect of investment.
2. It is consistent with, and relates to, accounting data.
3. It is easy to calculate.

Exhibit 14-9. ROI components.

| | <i>Company A Fast Pennies</i> | <i>Company B Slow Nickels</i> |
|-----------------------|-------------------------------|-------------------------------|
| Sales | \$5,000,000 | \$5,000,000 |
| Net income | 50,000 | 250,000 |
| Investment | \$500,000 | \$2,500,000 |
| Net income as % sales | 1% | 5% |
| Investment turnover | 10 | 2 |
| ROI | 1% × 10 = 10% | 2% × 5 = 10% |

ratios to generate an adequate return on their investments (see Exhibit 14-9). Business A and Business B enjoy exactly the same return but achieve it in dramatically different ways.

The turnover-to-profitability relationship provides a useful concept for incisive ROI analysis evaluation of ROI performance.

Other ROI Applications

Although ROI analysis has found its greatest use in the measurement of overall corporate and ROI control center performance, other applications of this important management tool are almost unlimited. Take, for example, the not uncommon business proposal for a sales-force expansion into two new districts. Assume that the estimated increases in sales and in operating profits for such an expansion are as shown in Exhibit 14-10. On the basis of

Exhibit 14-10. ROI analysis of district market expansion.

| | <i>Atlanta</i> | <i>Cleveland</i> |
|-----------------------|----------------|------------------|
| Expected increase in: | | |
| Sales | \$100,000 | \$100,000 |
| Cost of goods sold | 55,000 | 55,000 |
| Gross margin | 45,000 | 45,000 |
| Marketing costs | 15,000 | 15,000 |
| Operating profit | \$30,000 | \$30,000 |

these figures, it appears that the district market expansion into Atlanta would produce the same results as expansion into Cleveland.

But you might also not that the all-important consideration—what investment must be made to support these expansions—has been ignored. Many make the mistake of assuming that because this is only a marketing expansion, no investment is involved. Nothing could be further from the truth. Investments are often thought of only in terms of additions to property, plant, and equipment, but in fact the “working capital” used to support a sales effort is a permanent investment. Working capital includes the accounts receivable (the credit that must nearly always be given to customers) and the product inventories that must be maintained to service purchase requests promptly.

Keep in mind that the investment in property, plant, and equipment is recovered not only through the earnings of the facility but also through the annual depreciation charges, which are not actual cash charges. In contrast, the investments that must be made to maintain the receivables and inventories are permanent investments and can be reduced only by means of absolute decreases in the amounts of accounts receivable inventory levels outstanding at any one time. So any marketing effort requires an investment of working capital, as is shown in Exhibit 14-11.

We can see that once the working capital investment required to support the market expansions is identified (assuming, of course, that the estimates are reasonable), Cleveland is found to be a more attractive location than Atlanta. By using the turnover-to-profitability approach to ROI analysis, we can see that the higher return in Cleveland is the result of more frequent turnover of assets than is anticipated for Atlanta.

The ROI approach can be used not only to analyze initial investment but also to monitor performance. The approach can therefore be used to evaluate the Cleveland district manager's performance—how well he or she meets sales objectives and controls marketing costs and how well he or she manages the accounts receivable and inventories used to generate these sales. Sales managers cannot simply emphasize “volume”; they must operate in an overall business context and attempt to optimize the return on investment.

$$\frac{\text{Cost of sales for 1995}}{\text{Average inventory year end 1994 and 1995}} = \frac{\$280,000}{(70,000 + 60,000)/2}$$

$$= \frac{\$280,000}{65,000} = 4.3$$

By dividing the average inventory into the cost of sales, we obtain a ratio of 4.3. To interpret this ratio, we employ the same logic that we used in determining the average collection period. If the cost of sales is the total cost incurred over a period of one year, 19X5, and the average of the inventory at the end of 19X4 and 19X5 is \$65,000, this means that the inventory "turned over" 4.3 times during the year; that is, the company sold its inventory approximately one time every 85 days (365 days divided by 4.3), and its inventory of \$65,000 can be converted to \$65,000 of either accounts receivable-net or cash in a period of a little under three months.

By itself, the inventory turnover ratio indicates how long it takes a company to liquidate its inventories either into accounts receivable-net or into cash. Also, a business's inventory turnover ratios can be revealing when they are compared over a period of time. If over a particular period the inventory turnover ratio declines, that is, if it decreases from 4.3 to 4.0 to 3.5, this decrease suggests that the company's product is becoming less salable, portending difficulties for the company. In some situations, a decline in inventory turnover may simply reflect a general economic slowdown with reduced personal consumption.

Many additional ratios can be used to analyze the company's liquidity. The four we've reviewed, however, present the fundamentals. Let's turn next to the analysis of business solvency.

Solvency Analyses

The *Random House Dictionary of the English Language, 2nd ed.* (New York: Random House, 1987), defines solvency as the "ability to pay all just debts." Under this definition, liquidity and solvency appear to be much the same thing. As we indicated at the outset of this chapter, however, we are considering liquidity as the ability to maintain a sound financial position over the short term and

solvency as the ability to maintain a sound financial position over a longer term.

This distinction is more than academic, for a company requires more than short-term capital. In the life of every company, there comes a point when it can no longer finance its operations on the basis of current liabilities. When this occurs, it can look either for long-term debt, involving repayment terms of anywhere from five to 25 years, or for additional shareholders' equity. Shareholders' equity, which in the case of a corporation involves the issuance of common (or preferred) stock, is almost always totally permanent capital. Long-term debt, on the other hand, must be repaid and also bears an interest cost that, along with the principal, must be paid by the business. For the purposes of most financial analyses, however, long-term debt can be considered relatively permanent capital. The most common form of long-term debt is bonds, which appear as long-term liabilities on the balance sheet, just above shareholder's equity.

The analysis of corporate solvency involves an examination of the adequacy of the permanent source of capital available to a business. The first and most common ratio used in this evaluation is the so-called debt-equity ratio.

Debt-Equity Ratio

The **debt-equity ratio** measures the amount of long-term debt in relation to the amount of shareholders' equity that a business has as its permanent capital. This is arrived at by adding the long-term debt and the shareholders' equity to find total permanent capital and then determining the percentage of each in relation to the total, yielding the debt-equity ratio. For XYZ Tool Machinery, this calculation is:

| | |
|------------------------------|-----------|
| Long-term debt (liabilities) | \$ 70,000 |
| Shareholders' equity | 133,000 |
| Total | \$203,000 |

$$\frac{\text{Long-term debt: } \$70,000}{\text{Long-term debt + shareholders' equity: } \$203,000} = .35$$